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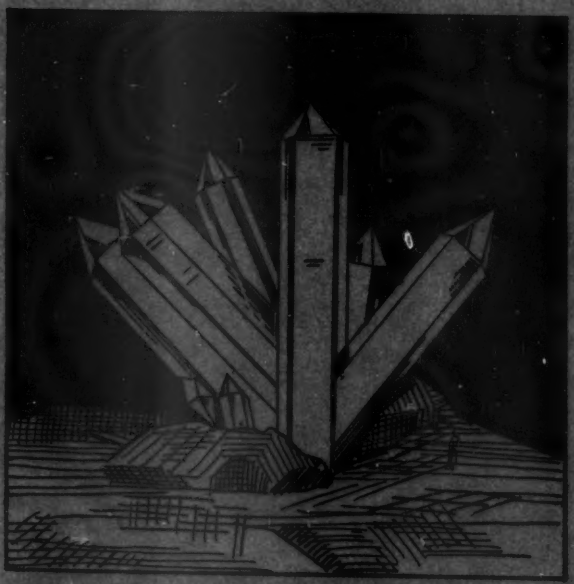
WHOLE NO. 87

ROCKS AND MINERALS

Magazine For Mineralogist, Geologist & Collector



OFFICIAL JOURNAL OF

THE ROCKS AND MINERALS ASSOCIATION

PUBLISHED MONTHLY

JULY, 1934

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ROCKS and MINERALS

A MAGAZINE FOR MINERALOGIST, GEOLOGIST AND COLLECTOR

PUBLISHED MONTHLY --- FOUNDED 1926

Volume 9, No. 7 **Whole No. 37**

CONTENTS FOR JULY, 1934

PAGE

The Hawley Mineral Belt, Massachusetts.
By Elwyn L. Perry, Ph.D. 93
The Amateur Lapidary.
Conducted by J. H. Howard 99
Our Junior Club.
Conducted by Ilsien Nathalie Gaylord 100
Rocks and Minerals Association
Second National Outing 103
Club and Society Notes 107
Philadelphia Mineralogical Society 107
Mineralogical Society of Southern California 107
Long Island Mineralogy Club 107
Readers' Section 108

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ROCKS AND MINERALS PEEKSKILL, N. Y., U. S. A.

The Official Journal of the Rocks and Minerals Association

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PUBLISHED MONTHLY

The Official Journal *of the* Rocks and Minerals Association

JULY 1934

VOL. 9, No. 7

WHOLE No. 37

The Hawley Mineral Belt, Massachusetts

By ELWYN L. PERRY, Ph.D.

Williams College, Williamstown, Mass.

Introduction

The highlands of western Massachusetts, between the Connecticut River and the Great Berkshire Valley, have long been noted as collecting grounds for the mineralogist. It is unfortunate, however, that most of the information concerning localities in this region is so old and so indefinite that it is difficult to relocate them without a considerable expenditure of time and energy, both in investigation of the literature and in the field. Although most of the exposures described in the older literature are now so weathered and obscure that they scarcely repay investigation from the standpoint of the collector, a few of the localities in this region are well worth a visit by either amateur or professional mineralogist because of the excellent or unique specimens afforded.

The large number and variety of mineral occurrences in the highland region does not permit of extended treatment here. A few localities, particularly the Barrus lithia-pegmatite dike in Goshen and the Plainfield rhodonite locality have been mentioned in the pages of ROCKS and MINERALS[1] but aside from such infrequent descriptions in the modern literature the collector in this region is dependent for his information on such antiquated works as Emerson's "Mineral Lexicon of Franklin, Hampshire and Hampden Counties."[2] Two other works by Emerson, "The Geology of the Old Hampshire Co., Mass."[3] and, to a lesser degree, "The Geology of Mass. and R. I."[4] are also useful as sources of general information.

As a whole, the region is characterized by a series of parallel, north-south belts of metamorphosed sediments, with perhaps a few equally metamorphosed igneous rocks. The grade of metamorphism increases from west to east in the sedimentary series and, in addition, several masses of relatively young igneous intrusions (the Williamsburg Granite and associated pegmatites) increase the variety and complexity of mineral associations in the eastern part of the highlands.

It is hoped that the following description and comment, on a portion of the highland area, will encourage a renewal of interest in this accessible but almost forgotten region; a region which fifty years ago was literally a mineralogist's paradise.

The Hawley Schists

One of the most interesting of the several divisions of the highland region

[1] Browne, B. V., ROCKS AND MINERALS, Vol. 8, 1933, pgs. 115-116.

[2] Emerson, B. K., U. S. Geol. Survey Bull. No. 126, 1895, 180 pgs.

[3] Emerson, B. K., U. S. Geol. Survey Monograph No. 29, 1898, esp. pgs. 78-176.

[4] Emerson, B. K., U. S. Geol. Survey Bull. No. 597, 1917, pgs. 40-49 and map.

and one readily available to the collector, is that underlain by the Hawley formation. This area, as indicated on Emerson's geologic map of Massachusetts, is roughly lens shaped, extending southward from the Vermont boundary through Charlemont on the Mohawk Trail (Mass. route No. 2) to the vicinity of West Cummington on the Berkshire Trail (Mass. route No. 9) and possibly southward as a narrow belt into the town of Chester.[5] The Hawley formation is bounded on the west by the monotonous quartz-sericite-chlorite schist of the Savoy formation, with but few interesting minerals, and on the east by the equally uniform Goshen formation, a black, graphitic schist (or phyllite).

The Hawley formation has sometimes been described as an amphibolite, a term which is strictly applicable to only a small proportion of the whole, although hornblende is everywhere a most important and characteristic mineral. The most common rock type is a hornblende-quartz-sericite schist with locally abundant garnets and biotite or chlorite. There is much variation in both the amount and arrangement of the hornblende present; some layers of the strongly banded schists contain tiny scattered needles of the amphibole, while others bear large clusters of six-inch blades associated with garnet crystals more than an inch in diameter. The arrangement of the hornblende in bundles of crystals is quite common and led President Hitchcock to apply the very apt term "fasiculite"[6] to specimens from this area. In some of the hornblende schists are layers containing abundant rhombohedrons of ankerite. There are also numerous bands of massive chlorite rock containing ankerite, some of which afford fine specimens, but only at localities where the zone of surface weathering has been removed, since the ankerite weathers readily to limonite discoloring the rock dark brown throughout. Some of the massive chlorite-ankerite rocks so closely resemble those associated with the talc deposits known to have been derived from igneous rocks that a similar origin seems possible, although no conclusive evidence of this has been advanced. The greater part of the Hawley formation was probably derived through the alteration of a group of iron-rich calcareous sediments with considerable variation in individual beds.

Some of the hornblende from the Hawley formation has been described as cummingtonite and it is possible that the original cummingtonite, of Dewey,[7] came from this formation although it was more probably from the Goshen or Conway formations adjoining on the east. All three formations outcrop in the town of Cummington.

No one outcrop gives an entirely adequate impression of the whole series of schists included in the Hawley formation, but a fairly representative and accessible exposure may be found just off the Mohawk Trail on the Zoar road (Fig. 1, No. 1). This road branches from the main highway at the east end of a concrete bridge about two miles west of Charlemont. Here the schist series is exposed in road cuts over a distance of about one hundred yards and good specimens of hornblende, chlorite, epidote, ankerite, etc., may readily be obtained. Another representative outcrop is located about a quarter of a mile west of Charlemont railroad station, on the road south of the tracks (Fig. 1, No. 2). Stone walls, particularly in the high pastures, yield numerous good specimens throughout the region and stream beds furnish equally good hunting grounds during the late summer.

The Davis Pyrite Mine

One of the most famous localities in the Hawley area is the old Davis Pyrite Mine in Rowe township, about five miles north of Charlemont (Fig. 1, No. 3). The mine is easily reached from Charlemont, starting from Wells Corner, by following the road north along Mill Brook, the bed of which is heavily coated with limonite ("iron rust") coming from the mine waters. This formerly well known mining property was opened in the spring of 1882 by Herbert J. Davis, a mining engineer whose experience in working similar properties in Canada led to his appreciation of the possibilities of this deposit. The purity of the pyrite (freedom from arsenic) and the fact that it could be obtained in solid lumps, rather than dust, enabled the owners for years

[5] This area is included on the Hawley and Chesterfield topographic sheets issued by the U. S. Geological Survey.

[6] Hitchcock, E., Amer. Jour. Sc. Vol. 6, 1823, pg. 226.

[7] Dewey, C., Amer. Jour. Sc. vol. 8, 1824, pg. 59.

to command a premium for their product used in manufacture of sulphuric acid. The Davis mine is often said to have been the only successful mining venture in Massachusetts in modern times. The mine was finally "worked out" late in 1909 and, following the "robbing of pillars," the main workings collapsed in 1910. Some production continued as late at 1911 from the reworking of material on the old dumps,[8] but since then neither this property, nor any which has been prospected in the surrounding region, has yielded workable ore.

Records of the geology of the Davis Mine are scanty and unfortunately little can be deduced from the present rock exposures. Most of our information comes from a paper by J. J. Rutledge,[9] published in 1906, although this deals primarily with the mining and milling rather than the occurrence of the ore. The main ore body consisted of a lens of practically pure pyrite as much as twenty feet thick, which was worked about 900 feet along the strike and 1200 feet down the dip. The lens was essentially conformable with the enclosing schists, which here have a high easterly dip and strike a few degrees east of north. The pyrite vein was said to thicken and thin locally "in much the same manner as peas swell a pod," and was not worked where less than five feet thick. The hanging-wall and foot-wall were rather sharply defined so that the deposit was often referred to as "a true fissure vein."

Lumps of the solid ore, consisting of an aggregate of small pyrite grains, are still common on the upper mine dumps, but only a small quantity of pyrite with external crystal faces can be found. To the mineralogist the small veins are of vastly greater interest; these were apparently formed in the wall rocks as off-shoots or associates of the main vein and consist essentially of quartz-pyrite stringers interlayered with the schists. It is principally in, and on the margins of, these veins that the rare zinc spinel, gahnite, is found. The mineral was first described from this locality by A. G. Dana,[10] in 1885, not long after the opening of the mine. The gahnite occurs in greenish black crystals of very high luster; for the most part they are combinations of the (dominant) octahedron combined with the rhombic dodecahedron in oscillating growth, often in such a way as to form beautiful terraced crystals. The best crystals are commonly about one quarter of an inch in diameter, but a few slightly more than half inch across have been found by the writer. The spinel occurs both in the vein quartz and in the granular pyrite but with a different habit in each; the crystals in

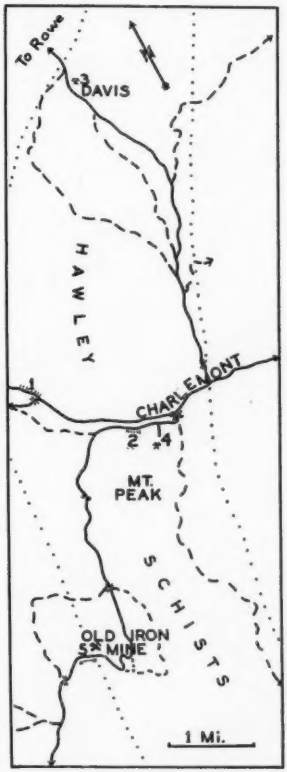


FIG. 1

Map of northern part of Hawley mineral belt. Numbers indicate localities mentioned in text. Solid lines indicate roads followed in the route described. Dotted lines are boundaries of the Hawley formation.

[8] Mineral Resources of U. S., 1909, Part II, pg. 692.

[9] Rutledge, J. J., Engineering and Mining Journal, vol. 82, 1906, pgs. 673-676, 724-728, 772-775.

[10] Dana, A. G., Am. Jour. Sc. (3) vol. 29, 1885, pgs. 455-456.

the quartz are usually simple octahedrons free of inclusions, while those in the pyrite commonly contain specks of pyrite and are usually strongly terraced. At present, good specimens are available on the dumps nearest the northernmost opening on the property and both loose crystals and those in lumps of vein material may be picked up on the surface, especially after a heavy rain which washes and partially concentrates the material. As Dana has shown by analysis, the gahnite from this locality is a particularly pure zinc variety, automolite, $ZnAl_2O_4$, unlike the better known iron-manganese bearing variety, dysluite, (Zn. Fe. Mn) O. (Al. Fe.) $2O_3$, from Franklin, New Jersey.

In addition to the quartz, pyrite, and gahnite, a few other minerals have been observed in small quantities in the fragments of vein material on the upper mine dump. Lumps of limonite gossan from the original weathered portions of the vein are fairly common. Scattered grains of chalcopyrite and sphalerite have been observed in the ore and were said to be fairly abundant in the lower part of the mine, but the material on the dumps yields rather poor specimens at the present time; most of the zinc present obviously went to form gahnite rather than sphalerite. A few flakes of molybdenite have been observed by the writer, as well as a few typical prisms of rutile and thin sheets of ilmenite. The above mineral association as a whole indicates a high temperature, deep-seated origin, a conclusion which is further substantiated by the presence of feldspar in some of the quartz-pyrite veins, which thus resemble small pegmatite dikes. In the schists adjacent to the main vein conditions apparently greatly stimulated crystallization and large, well-formed crystals of garnet and hornblende are common.

The Mount Peak Mine

A pyrite vein very similar to that at Davis, but much smaller in every way, occurs a few hundred yards southwest of Charlemont railroad station on the old Hawkes farm (Fig. 1, No. 4). The outcrop is at the base of the northeast spur of Mount Peak at the level of the highest river terrace and is well marked by an old chimney. The vein is vertical and about one foot wide as now exposed in the lowest open cut. It was explored at one time (1909) by a shaft about 150 feet deep and by several open cuts and trenches higher on the hillside, but no more than two feet of ore was found in the widest part of the vein and the workings were abandoned.[11] Lumps of granular pyrite are present in considerable quantity on the dumps and the presence of gahnite was recorded from here several years ago[12] but the writer has been able to find only a few specimens (near the upper part of the exposed vein) and they are very inferior to those obtainable at Davis. Melanterite is often available on the lower mine dump under slabs of schist where the oxidation of pyrite has formed this sulphate and exaporation has concentrated it in spots sheltered from rain. The melanterite occurs as soft, yellow, concretionary masses or, if dry, as a whitish powder. It is well for the collector to provide a small box or bottle to use in transporting this mineral but it is readily preserved after drying out. A few other minor occurrences of pyrite have been recorded from near Charlemont, but they seem to differ only slightly, either mineralogically or geologically, from the localities described above.

Old Hawley Iron Mine

The old Hawley Iron Mine, situated near the north end of Forge Hill in Hawley, has yielded many fine specimens of "micaceous iron" for which it is justly famous. The mine is conveniently reached from the Mohawk Trail by crossing the Deerfield River on the covered bridge at Charlemont and proceeding west and south about four and one half miles, as shown on the accompanying map (Fig. 1, No. 5). The road crossing Forge Hill near the mine is in poor condition for auto traffic (especially during wet weather) but the circuit can usually be negotiated from east to west to connect back onto the highway along the Chickley River. The mine is near the north edge of an open pasture, two or three hundred yards north of the hill road, and at about the same level as the crest (saddle) of the ridge. At present the only signs of former mining activity are an old open cut about three feet wide and steeply in-

[11] Mineral Resources of U. S. 1909, Part II, pg. 692.

[12] Flint, G. M., Am. Jour. Sc. (4) vol. 26, 1908, pg. 584.

clined between solid walls of schist, the ruins of a timbered shaft, and a few small dumps at the edge of the woods.

The rocks on the steep hillside east of the mine are schists of the Hawley formation, while those at the open cut and westward are the Savoy schist. Emerson[13] has pointed out the probability of a fault along the contact of the two formations, a probability which seems to be substantiated by field evidence from here southward, although the exact nature of the fault is in question. Solutions rising along the fault zone and penetrating the wall rocks have here introduced numerous small quartz-magnetite veins, and on the west side of the fault have replaced some beds of the Savoy schist with hematite. All stages of replacement between the original quartz-sericite schist and a pure hematite schist may be observed on the west wall (foot-wall) of the old open cut. The hematite schist, or "micaceous iron," preserves to a remarkable degree the pre-existing structures such as the schistose parting, secondary plications, and even the form of the separate micaceous (chlorite?) flakes of the original. In the process of replacement the micaceous minerals of the schist were evidently attacked first, forming a rock composed of alternate thin layers of micaceous hematite, i.e. pseudomorphs of hematite after mica, and granular quartz, and this in turn was later replaced converting the entire rock into steel grey hematite of brilliant luster. This hematite schist bears at least a superficial resemblance to the "itabirites" of Brazil and elsewhere. The pure hematite rock on Forge Hill was only about one foot thick and was flanked by partially replaced layers totaling about three feet; most of this material was mined out in the open cut, but enough remains to give an adequate idea of this unusual occurrence and to furnish excellent specimens.

The quartz-magnetite veins mentioned above are abundantly represented on the mine dumps and are particularly interesting because of the associated minerals. The magnetite itself occurs in the strongly banded schists as well as in the quartz veins, and all gradations may be observed from bands of quartz-muscovite schist containing scattered octahedra of the iron oxide to bands of massive magnetite an inch or two thick. Associated with the magnetite are occasional patches and bands of beautiful little, clear, brown garnets with vitreous luster; some of the garnets exhibit the common rhombic form, but most are irregular and close packed, grading into bands of granular flesh-colored material resembling a fine sandstone. This peculiar, if not unique, mode of occurrence of garnet is particularly noteworthy. Emerson found the brown garnets to contain manganese[14] and he termed the granular rock composed of them "a coticule or quartz-garnet rock." Qualitative chemical tests made by the writer show the granular material to contain abundant manganese and iron, with a relatively small amount of calcium. The composition, together with the physical characteristics (color, luster, etc.) suggest a variety of andradite, $(Ca, Mn)_3 (Fe, Al)_2 Si_3O_{12}$, possibly rothoffite, rather than the "true manganese garnet" spessartite, $Mn_3 Al_2 Si_3O_{12}$. The latter is described as invariably some shade of red, while all the material observed in Hawley is pale yellowish brown, or topaz colored in isolated crystals. A more complete chemical investigation would of course be necessary to determine the exact variety of garnet present.

Bands of the granular, flesh-colored garnet rock interlayered with the massive chlorite-ankerite rock so common in the Hawley formation, have been observed within a narrow belt extending between the "Old Iron Mine" and the Plainfield rhodonite locality about nine miles to the south, and at the latter place both individual crystals of the manganese garnet and the granular rock have been found. The pale brown manganese garnets are apparently restricted to the vicinity of the fault zone on the western edge of the Hawley schist belt and should not be confused with the reddish brown garnets (almandite?) abundant elsewhere in the common schist of the region.

[13] Emerson, B. K., W. S. Geol. Survey Monograph No. 29, 1898, pgs. 171-175.

[14] Emerson, B. K., U. S. Geol. Survey Monograph No. 29, 1898, pg. 174.

The Plainfield Manganese Mines

From the Old Hawley Iron Mine one may conveniently rejoin the Chickley River road, at the foot of the hill west of the mine, and proceed southward about nine miles to the Plainfield rhodonite localities near the Berkshire Trail (Fig. 2, No. 6 and No. 7). The river road is followed to the intersection of route No. 116, the Adams-Savoy-Plainfield highway, which is followed about one and one-half miles southward to the side road leading westward (near the end of the paved section of the highway). On the side road take the first left and next right forks and shortly turn southward crossing a small brook; about 300 yards south of the brook, in a clump of birch trees some 50 yards east of the road, is one of the two rhodonite localities. The prospect pit here has unfortunately been partially filled in and only a few much-weathered boulders remain to mark the location of the quartz-rhodonite vein. The locality is chiefly of geologic interest as it shows the position of the fault line along which the iron-manganese deposits are located.

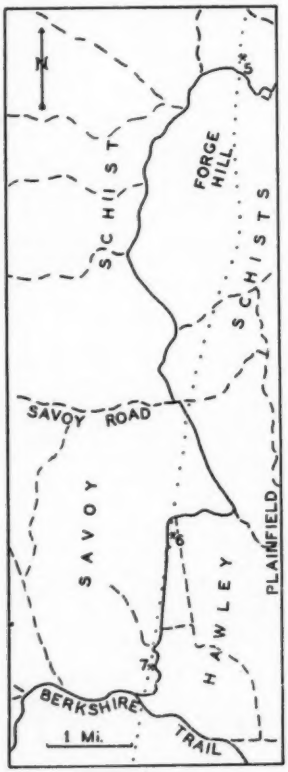


FIG. 2

Map of central part of Hawley mineral belt. Numbers indicate localities mentioned in text. Solid lines indicate roads followed in the route described. Dotted lines show the western (fault) boundary of the Hawley formation.

Continuing southward about a mile and three-quarters, the main "manganese mine" is fifty yards west of the road on a low bush-covered ridge. This locality is a short distance inside the north edge of the Chesterfield topographic sheet. At the present time a tar-paper-covered shack near the road, and a few feet northeast of the open cuts of the mine, serves as a convenient location marker. This famous locality yields beautiful, massive, pink rhodonite, which is abundant both in the solid ledges and in loose boulders, although it is in part altered on the surface to jet black pyrolusite and pale brown rhodochrosite. The rhodonite is intimately associated with quartz veins, with which are found the manganese-bearing garnets, pyrite, ankerite, and other minerals. The whole association bears a notable resemblance to the Forge Hill deposits farther north, especially in the presence of numerous bands of the granular, flesh-colored, manganesian garnet rock.

This Plainfield manganese locality was apparently the source of the many glacial boulders of rhodonite found in the town of Cummington about three miles to the southeast, and to this day Cummington is more often cited as the source area of the rhodonite than is Plainfield. The term "Cummingtonite" was applied at one time to the rhodonite, through an unfortunate error, but that term is now used for the iron-magnesian amphibole originally described from the same town.

From the rhodonite mine the visitor can readily reach the Berkshire Trail, a through east-west highway, by continuing south a few hundred yards, down the steep hillside, into the Westfield River valley.

Other Mineral Localities

Within the regions adjoining that described above are many other mineral localities of considerable interest to the collector. Near the village of Rowe, northwest of the Davis Mine, beautiful masses of actinolite and talc are found at the old talc mines. Green foliated talc also occurs near the east end of Hoosac Tunnel and at several other localities southward in the same belt. The Chester Emery Mine,[15] just west of Chester village on the Jacobs Ladder Trail (route No. 20), the serpentine area in Middlefield north of Chester, and the pegmatite dikes of West Chesterfield and Goshen are all famous localities within the area of the Hawley and Chesterfield quadrangles.

Farther west, in the Becket quadrangle, are many small areas of altered limestones (the Coles Brook limestone)[16] with actinolite, tremolite, graphite, titanite, coccolite, epidote, chondrodite, and other minerals of the limestone contact association. A few miles to the east is the Connecticut Valley region with its many zeolite localities, the lead-zinc veins of Loudville, and many other places of geologic and historic interest.

It will readily be appreciated from the above descriptions and comment that the scenic region extending from the Jacobs Ladder Trail northward to the Massachusetts-Vermont line is one well worth the attention of the mineralogist and particularly one who is interested in the origin and occurrence of minerals as well as in their objective study.

[15] Shannon, E. V., Amer. Mineralogist, vol. 4, April 1919, pgs. 37-39.

[16] Emerson, B. K., Geol. of Eastern Berkshire County, U.S. Geol. Survey Bull. 159, Pgs. 13-127.

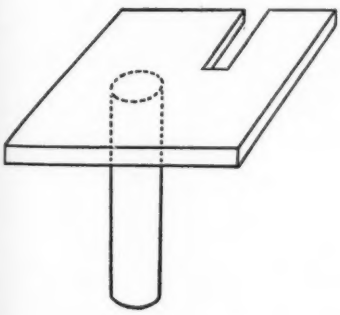
The Amateur Lapidary

Conducted by J. H. HOWARD*

504 Crescent Ave., Greenville, S. C.

Amateur and professional lapidaries are cordially invited to submit contributions and so make this department of interest to all.

*Author of—*The Working of Semi-Precious Stones.* A practical guide-book written in non-technical language for those who desire to cut and polish semi-precious stones.



Sketch showing slot in which saw revolves and rod which fits into socket of tool rest.

For the occasional small single cut you will not want to rig up the swinging arm stone holder. To saw the stone without this swinging arm, holding the stone by hand you need a rigid rest. Rig one from the tool rest of your grinder. See sketch. The whole job of rigging for a cut using this scheme will probably take less than a minute.

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Our Junior Club

Conducted by
ILSIEN NATHALIE GAYLORD

Dear Juniors:

Hearty greetings to the new members who have been joining our Club the last few weeks, and a welcome to share our good times in the lesson hour and the Question Box contests. It is quite a tug-of-war now to see who will win the fine prizes given to us by so many of our kind friends.

Exciting experiences some of our Club members have had in their search for more specimens for their collections. One member writes that their whole town is excited because some workmen who were making a roadway, uncovered a little deposit of gold. The local jeweler said it tested as gold, but to be perfectly sure it has been sent away for expert analysis. It is believed that the deposit was brought down some twenty thousand or more years ago by a glacier in the Ice Age, since no other gold has ever been found in that vicinity.

Another of our Club members in the northwest writes that he and some friends found several varieties of feldspar, spodumene, and other minerals in the gravel used on the driveway around a large public building. The surfacing for this road was brought from an old mine dump near there. It must have been exciting work finding first one and then another and another of those unexpected specimens right in the driveway.

One of our Canadian boys writes that he and his family on their horses followed an old trail for awhile to see where it led. At the end was a big excavation made by an avalanche down the mountain. Just a fine place to find all sorts of good rocks and mineral specimens.

So our busy Club members east and west, north and south are eagerly searching every possible location for more specimens for their collections. But we must not talk more about this now, for we have a full lesson hour and an interesting one ahead of us today.

CALCITE

First shall we finish our study of calcite? Last month we learned that calcite is next to quartz in abundance and looks much like it. But they have many different habits which help us to distinguish them. See how a few drops of hydrochloric acid on this calcite crystal starts it bubbling. That is the carbon dioxide being freed, the same which charges your soda water. But on this quartz crystal the acid has no such effect. Also see how easily we can scratch calcite in comparison with quartz which is so very hard.

As for the form of calcite, there are at least two or three hundred forms which it assumes, although the basic one is a rhombohedron. Its colors, too, would make a rainbow. This piece of salmon calcite is a beautiful specimen, and all these others, blue, green, honey and golden yellow, red, and brown are equally attractive. Seeing these many shades one could scarcely realize that the natural color of calcite is clear or snowy-white.

Here is an icicle-like stalactite from a limestone cave. It also is formed of calcite, and so is this sparkling white piece tinged with faint green which looks like a miniature iceberg. These other stalactites are aragonite, still another form of calcite but a little harder and crystallizing differently.

Now comes a surprise. Look at this beautiful string of pearls. They cost many hundreds of dollars, yet they also are calcite, the aragonite form of it. They were made by this ocean shell animal. Do you see that the inside of his shell looks exactly like the pearls? This is how the little sea creatures make them.

When a grain of sand or tiny bit of broken shell happens to lodge in the folds of a shell animal's soft body, of course it is irritating. So the shell creature covers it over with layer after layer of smooth shell substance. That substance is aragonite, and we call the

little ball of it a pearl. The mother-of-pearl pieces which we use in jewelry and for inlay work are bits of shelly aragonite cut from the lining of sea shells, and these red and pink coral beads are a form of non-crystallized calcite.

One other kind of calcite we sometimes use as jewelry, but really it is far more beautiful as a large specimen like this one. It is satin-spar, and is made of many layers of long needlelike crystals lying side by side. The effect is like shimmering pink or white satin. You will surely want a piece of this lovely satin-spar for your collection.

AN EXPERIMENT OR TWO

Now let us try a little experiment with this calcite crystal. Carefully we will strike it with a sharp quick blow, and see what happens. It breaks into rhombohedrons. Let us crack one of these, and again see what happens. More rhombs. Just so it will go on and on breaking into smaller and smaller rhombs regardless of how finely you powder it. That is a firm habit of calcite. Whenever you find a rough calcite crystal, if you will just break it up like this you will have a whole set of perfect rhombs in place of the unlovely crystal.

Here is another piece of calcite crystal, an especially clear rhomb-shaped piece. We will draw a black line on this paper, and set the crystal on it. Do you see them, the two lines instead of just the one line which we drew? Also this kind of calcite will double whatever it is placed over, whether letters or lines.

Now we will draw two dots a short distance apart and move the crystal around on them. There they go—or seem to go—chasing one another around and around. It is all because of the action of light through the crystal. This kind of calcite crystal is called Iceland Spar. It makes a fascinating specimen in your collection to show to your friends. Indeed, the whole big calcite family is a beautiful and interesting set of minerals.

FLARES AND FIREWORKS

Fourth of July! Whizz, bang, pop and sputter! Just what minerals are these which make all this light and noise on our national holiday? Suppose we investigate a few of them very cautiously. These Roman candles, for instance. What makes them go whizzing up so high, and then burst into colored balls of fire?

The power which sends them up and up one hundred, three hundred, five hundred feet into the sky is imprisoned gas, expanding through a vent. The gas is formed by the burning of various chemicals in the tube of the candle. But it is the colored balls which most interest us. Your specimen of barite would give those balls a bright green color, for barium burns with a green flame. Or perhaps you have a piece of witherite. That also burns green, for it is a member of the barium family. But it is not barium alone which is used in the fireballs and flares. Charcoal or your sulphur specimen, each of them powdered, need to be mixed with it as fuel. A bit of potassium chlorate supplies extra oxygen for the burning of them.

Powdered zinc could be substituted for the barium with good result. But how exceedingly careful one must be when handling these powdered metals, and how sure that just the right proportion of the chemicals is used to avoid an explosion. They have such unexpected and disastrous habits. Iron, for instance. No one is afraid to handle a piece of cold iron. Yet that same piece when powdered would burst into a fierce hot flame at the touch of a spark or the least friction.

The same is true of many metals. Magnesium metal also makes a quick dazzling white flare from a careless spark or handling. It is this magnesium metal made safe with paraffin which makes the little Fourth of July "sparklers" for the children. These sparklers will shower colored sparks by using the same minerals which color the Roman candles, the flares, the beautiful set pictures, water-falls, and other showy fire-works' displays.

To make the yellow flares they use just common salt, sodium chloride, mixed with powdered sulphur and potassium nitrate. Have you a specimen of strontianite? Usually it is pale green or faint yellow color, but it burns with that brilliant red light which we all know so well. Celestite, a sky blue mineral, and a near relative to strontianite, also burns a

bright red. The lovely violet shades come from copper.

Strange that not one of these minerals is the same color as its flame. Strontianite, a pale green, burns intensely red. Celestite, a heavenly blue, also burns red. Barite, white, flames a brilliant green. Salt, likewise white or clear, expires in a golden light. And who would believe that copper hid within itself all the lovely shades of mauve, purple and violet? Magnesium metal seems about the only one to go out in its own color, dazzling white.

It is these minerals and a few others packed in various ways into the tube of a Roman candle, or shower, waterfall, or flare which explode at the touch of the fuse-light, and make our Fourth of July celebrations such a beautiful riot of color and light.

BE SURE

To look most carefully at each clear crystal of any kind that you find, to see if there is a moving bubble in it. Tip the crystal back and forth in all directions so that if there is a bubble in it, it will move. They are fairly rare, these moving bubbles of liquid or air caught in the crystal when it was forming thousands upon thousands of years ago. A large amethyst crystal containing a bubble recently sold for twelve dollars, a not unusual price for such a specimen.

In size these moving bubbles range from mere pin points to a good-sized drop, and there may be several small ones or only one larger one in the crystal. No one knows but that the next crystal which they pick up may contain one of these treasures.

THE QUESTION BOX

1. What is quicksand? How do you think it was formed, to make it so different from ordinary sand?
2. What color is sulphur, and when burning what is the color of its flame?
3. What mineral is charcoal?
4. Is dust a mineral? Are coal and wood ashes minerals?
5. Why does silverware tarnish when exposed to the air?
6. What process occurs when minerals tarnish, and are gasses really minerals?

PRIZES

Three first class prizes will be given for the three best answers to all of the questions.

Three second class prizes will be given for the three best answers to any four of the questions.

Three third class prizes will be given for the three best answers to any three of the questions.

Send your answers by August 15th to Our Junior Club, ROCKS and MINERALS, Peekskill, New York.

PRIZE WINNERS

The winners of the April prizes were a First class prize to Roger Bent, of Connecticut, quartz crystals. Albert Kidwell, Missouri, staurolite. Llewellyn Gray, California, chrysocolla. Ottomar Keinath, Michigan, obsidian. Doris Moore, New York, chrysocolla. Mildred Kitson, Massachusetts, desert rose. Adele Bartz, New York, quartz crystals. Paul Brown, California, floating stone. Lloyd Felton, Massachusetts, agate nodule. Gerard Gallagher, New Jersey, chrysoprase. Edward Styer, New York, claystone concretions. Margaret Dudziak, New York, calcite crystals. Ruth Styer, New York, staurolite. Richard Hartshorn, Massachusetts, agate nodule. Pat O'Lane, Canada, rhodonite. Duane Faulkner, New Jersey, sand geode.

Clyde Allan, Jr., one of our young members and who was graduated in June from the Waterloo West High School, Waterloo, Iowa, has been honored by being elected a member of the Field Museum exploration party which will work in southwestern Colorado this summer. The Museum party, headed by Dr. Martin, is doing exploration work in the ruins of Pueblo Indian homes . The spot of excavation is in a high valley about 40 miles from any town. This particular village was inhabited about 600 to 1100 A. D.

Rocks and Minerals Association Second National Outing

The Second National Outing of the Rocks and Minerals Association, held on May 20, 1934, was a grand success in every way and many interesting minerals were collected—some heretofore not known to occur at the localities where found. Rain, that uncontrollable element which often plays havoc with the most carefully laid plans, did ruin a number of trips but from reports the attendance this year will greatly exceed that of 1933. Our grateful thanks are extended to all directors and to their assistants for their very cordial support, interest and co-operation in making the Second National Outing a most successful one.

Reports on the individual outings are as follows:

ALABAMA

Director—Dr. R. S. Poor. A party of 48 collectors left Birmingham at 8:00 A. M. for Sylacauga, 50 miles away, at which place we examined the Alabama Marble Quarries and the finishing plant of the Alabama Marble Company. Following this we left for Alexander City, stopping en route to examine a small deposit of low grade manganese ore (psilomelane) and some graphitic mica schist which was used as a source of graphite during the war. Twelve miles northeast of Alexander City is located the Hog Mountain Gold Mining and Milling Company. This is the best developed mine in the state of Alabama and at the present time they are processing a sulphide ore which carries from $4 to $25 free gold per ton. At this place we collected some fine specimens of the ore which is especially rich in pyrrhotite and carries smaller quantities of chalcopyrite. The gold seems to run higher in the ore richest in chalcopyrite. The gangue consists principally of black quartz in the high grades and a much lighter quartz in the low grades. The country rock is the gray Pinckneyville granite. This granite is a hornblende-biotite type and is somewhat gneissic.

The group returned home about 8:00 P. M. and seemed to have enjoyed themselves immensely.

CALIFORNIA (Needles Branch)

Director—J. C. McCorkle,—No report submitted.

CALIFORNIA—(Southern Branch)

Director—Herman Abraham. The Los Angeles Mineralogical Society together with the Mineralogical Society of Southern California celebrated "Rocks and Minerals Day" by traveling to the Crestmore Quarry near Riverside where beautiful blue and white calcite, green and brown garnets, several forms of epidote, riversidite, crestmorite, black tourmaline and other specimens that have not yet been determined, were collected. A visit was also paid to the Jensen Quarry in the same neighborhood. The weather was perfect and every one of the 110 collectors present had a most successful day. It was a great "Rocks and Minerals National Outing." May we have more of them.

J. W. PATTON,
Field Chairman.
Los Angeles Mineralogical Society.

CALIFORNIA (San Joaquin Valley)

Director—C. A. Noren. At 7:00 A. M., a party of six mineral hounds left Fresno for the Sierra Nevada serpentine belt near Piedra on the Kings River. The first stop was at an old magnesite workings where excellent specimens of magnesite, hydromagnesite and white opal, were collected. An old kiln used in burning the magnesite was also inspected.

At the next stop, about five miles up the river, chromite was obtained at some old diggings. Later the party enjoyed lunch on the banks of the Kings River.

Most of the afternoon was spent examining a pegmatite dyke near Academy. In it were found garnets, mica, black tourmaline, and graphic granite. The last stop was made at the Fresno Copper Mine where specimens of malachite, sericite mica and interesting rock garden material was obtained.

CALIFORNIA—(The Bay Region)

Director—John Melhase. No report submitted.

COLORADO

Director—Wayne W. Ward. The Rocks and Minerals Outing was a splendid success with forty collectors attending. The day was perfect and everyone seemed to enjoy the outing. The first visit was to the Florissant region where we made quite an impression on the natives with our string of nine cars and a geology bus. Here we secured many interesting specimens of fossilized plants and insects. Next we visited the gem mines region north of Florissant where many good amazonstone specimens were collected together with some smoky quartz and various other pegmatite minerals. We finally returned to Florissant and through the courtesy of Mr. Singer, were permitted to inspect the petrified forest, without payment of the usual fee of 50c per person, where more fossils were collected as well as specimens of petrified wood.

Our grateful thanks are extended to Prof. H. E. Mathias of the department of geology, Colorado College, for his cordial interest in the outing by accompanying the party as guide and advisor and for securing the geology department's bus for the transportation of a number of the party.

CONNECTICUT

Director—Mrs. Lillian M. Otersen. The New Haven Mineral Club held its National Outing at Strickland's Quarry, Portland, with 50 collectors being present. The weather was ideal and the group were merry and very enthusiastic so that many good specimens were procured. Among the specimens collected were pink tourmaline in a matrix of cleavelandite, cookeite, hair-tourmaline, albite, nail-head calcite, fluorite, white, green, and purple apatite crystals in cleavelandite, green cleavelandite, green beryl, garnets, pyrite, columbite, montmorillonite, spodumene, pink beryl, sphalerite, and a number of others that have to be determined. The outing lasted well into the afternoon and everyone felt it was a day well spent.

IDAHO

Director—Julian M. Field. No report submitted.

ILLINOIS

Director—Ben H. Wilson. The outing of the Illinois Division was held according to previously announced plans. There were 105 Rocks and Minerals "fans" in attendance and the meeting was pronounced a complete success from every standpoint. The locality chosen was ideal and the attendance, enthusiasm, material collected, and the weather were everything which one might ask for.

Following the noonday luncheon, which was eaten in picnic style under a large hawthorn tree situated on a high point overlooking the Des Plaines Valley, an informal meeting was held. The valley, which is the ancient outlet to old glacial Lake Chicago, is very wide at this point and furnished an excellent back-ground for the splendid talks given by Professors D. J. Fisher and F. L. Fleener concerning the geology and mineralogy of the local region. These talks were followed by several peppy talks by members upon miscellaneous topics and all joined in praising Editor Zodac for the very heroic work he is doing in keeping alive the magazine and the Rocks and Minerals Association during these very disheartening times. All pledged their loyalty and promised to secure subscriptions whenever possible.

MARYLAND

Director—Dr. Mark H. Secrist. (Due to illness in the family, Dr. Secrist was unable to conduct the trip. However, the trip was very ably led by two members of the Natural History Society of Maryland, Mr. A. Llewellyn Jones and Mr. M. E. Price, and to them is due full credit for the success of the outing).

A party of 12 left the Hopkins Circle, Baltimore, at 10:00 A. M., and the following places were visited:

1. Jones Falls at the Clipper Mill Road and in pegmatite were found: feldspar crystals, apatite, tourmaline and garnet.

2. Old Choate Chrome Mine at Soldiers Delight and in serpentine were found: chromite, chalcedony, and jasper.

3. Dyer Quarry at Soldiers Delight where magnesite, purolite, williamsite, deweylite and chalcelony were found.

4. Pleasant Hill, near Oqings Mills, and in Wissahickon Schist were found: garnet, staurolite, and cyanite.

5. Stevenson Quarry, near Eccleston and in Setters Quartzite were found: sericite and tourmaline (stretched).

6. Texas, Md. quarrys in crystalline Cockeysville Limestone where phlogopite, tremolite, scapolite, wollastonite, salmon-colored calcite, calcite crystals, and pyrite were found. In carbonate sand from the same locality wollastonite, tremolite and mountain leather were found.

MASSACHUSETTS

Director—John E. Kitson. The first outing of the Rocks and Minerals Association held in Massachusetts was a grand success with 107 collectors attending. The Barrus farm at Lithia was the chief scene of activities where visitors were hospitably welcomed and all made to feel at home. Boy scouts in uniform under Mr. Roy Bergman were posted at strategic points on the highways to direct visitors and to park cars. Mr. Anthony Kendrew greeted the visitors and had them register at a convenient table and performed necessary introductions. Mr. Edward Foster delivered the principal address which was very warmly received by those present. A unique feature of the outing were two exhibits, one of the minerals found on the farm and belonging to Mr. Alvin Barrus and the other a collection of precious and semi-precious stones belonging to Mr. Charles E. Winslow.

Late in the afternoon, the party visited the noted rhodonite locality at Plainfield where excellent specimens of the pink mineral were collected.

MISSOURI

No outing held.

NEBRASKA

Director—V. K. Overman. The Nebraska outing was a grand success with 53 collectors representing eight cities in western Iowa and eastern Nebraska attending. The first visit was to the State Fish Hatcheries, 22 miles west of Omaha, where artesian wells and great quartzite boulders were observed. The boulders were brought down from South Dakota ages ago by the glaciers.

Next, the party drove to Meadow, where a limestone quarry was visited. This quarry unlike most of them in the vicinity is tunneled and shows strata of limestone, marl, clay and shale. The temperature in the tunnel is 52° F. throughout the year and was a pleasant change from the 95° outside.

Crossed Platte River and passed through Louisville where a cement plant is located and thence to Weeping Water where lunch was eaten.

From Weeping Water several sites of dwellings of pre-historic man was visited and explained by Dr. G. H. Gilmore of the University of Nebraska. Continued to Nehawka where the use of the town hall had been kindly granted. There Dr. Gilmore showed slides and delivered a lecture on prehistoric man in Nebraska.

An ancient flint quarry was visited about three miles from Nehawka and there Dr. Robert F. Gilder, Omaha, pioneer archeologist and discoverer of the "Loess Man" delivered an address. After the lecture the party disbanded after pronouncing the outing a most interesting and educational one..

NEW YORK (Madison County Branch)

Director—Dr. Harold O. Whitnall. No report submitted.

NEW YORK (Metropolitan Area)

Director—Emmet Doherty. The scene of this outing was at the old Tilly Foster mine, near Brewster, with 120 collectors from the neighboring cities participating to make the affair a most enjoyable one. Many excellent specimens of bronzite, clinochlore, fluorite, chalcopyrite, chondrodite and magnetite were collected. The feature which excited most interest to those who visited the locality for the first time was the immense pit which is said to be 630 feet deep and which is about 300 feet in diameter. It is filled with water to about 50 feet of the top.

NEW YORK (Oswego Branch)

Director—Leo Doherty. Due to heavy rain which lasted all day, the outing could not be held. As over 100 collectors assured Mr. Doherty of attending, the outing was postponed to the following Sunday and it rained heavily all day again.

OHIO

Director—Thomas A. Chittenden. (This outing was held the day previous, on the 19th, as Saturday seemed to work out to better advantage).

A party of 16 men and boys assembled at the home of the director and spent some time inspecting his private collection. The day was ideal and shortly after 9:00 A. M., the party proceeded to Peninsula, north of Akron, where fossils were the objective, and where many interesting specimens were collected. Leaving Peninsula, the party proceeded to South Amherst to inspect the great sandstone quarries of that locality. Here they spent a very pleasant and profitable afternoon as they watched the cutting and hoisting of the huge blocks of stone (the quarry was working). The Berea Grit, as the sandstone is called, is in great demand for building purposes because of its light color, its even texture, ease of working, and peculiar property of turning to a uniform buff on exposure to the air. Many fine specimens were collected and when everyone had gathered their fill, the party left for home. All were satisfied, however, that the day was well spent and that Ohio's first Rocks and Minerals Outing was a very enjoyable and successful one.

OREGON

Director—J. Lewis Renton. No report submitted.

PENNSYLVANIA
(Waynesboro Branch)

Director—Robert G. Martin. No report submitted.

PENNSYLVANIA
(Northeastern Section)

Director—John S. Shrader. Only three collectors attended the outing of this section but they were well rewarded with good pyrite and fossil specimens from the coal mines of this locality.

PENNSYLVANIA
(Philadelphia Branch)

Director—Joseph L. Gillson. (Business necessitated the absence in Europe of Dr. Gillson and he turned the directorship over to Mr. W. H. Flack).

In perfect weather, five cars loaded far beyond the capacity and the safety point, left Philadelphia at 8:30 A.M. en route for Cornwall Iron Mine, at Cornwall. At Wayne, the party was joined by another car which relieved the congestion somewhat. Enroute, two more cars were overtaken and passengers redistributed. The mine was reached at 10:30 and the Philadelphia party of 49 was joined by a party of nine from Upper Darby Junior High School under Miss Eliabeth Morley; also by 19 members of the Thomas Rock and Mineral Club of Mt. Airy, Philadelphia under its President, Mrs. W. Hershey Thomas. The three parties totalled 77.

After arrangements had been completed with Mr. Entricken, the Superintendent of the mine, the party scattered all over the mine which is an open cut a half-mile long by three-eighths mile wide, with numerous dumps. It was agreed to assemble again at 4:30 P. M. for the return trip. Upon assembling it was found that some 25 minerals had been collected including several zeolites not listed in the "Minerals of Pennsylvania" by Gordon. The following minerals were found: apophylite, aragonite, augite, azurite, barite, byssolite, calamine, calcite (colorless, green, black, red), chalcopyrite, chalcedony, chlorinated biotite, chrysocolla, hyalite, hypersthene, lodestone, magnetite (crystallized and massive), malachite, melanterite, natrolite, pyrite (crystallized and massive), stilbite (white), serpentine (green, red), copper (native), garnets (brown, greenish-black), and hematite. Microscopic investigation of micro-pegmatite specimens by Mr. Frank J. Keeley, disclosed epidote, titanite (honey-brown), quartz, apatite and feldspar crystals.

RHODE ISLAND

Director—A. W. Quinn. Unpleasant weather practically ruined the Rocks and Minerals Outing. Heavy showers in the early morning and threatening clouds at the time for departure discouraged all but three of those who had planned to go on the trip. The three who went were vindicated in their judgment of the weather, however, for there was no further heavy rain during the entire trip. The collecting proceeded as scheduled.

Small veins of fluorite, smoky quartz, quartz with inclusions of hornblende needles, galena, chalcopyrite, and

sphalerite at Cumberland were visited first. Other stops were made at the Cumberlandite body of Iron Mine Hill, the quartz mass at Diamond Hill, and the limestone at the Dexter Lime Rock Quarry. The limestone quarry yielded crystals of calcite, dolomite and quartz.

The opportunity to meet each other was appreciated by those who attended the trip and it is hoped that later trips may be arranged for those who missed this trip.

SOUTH CAROLINA

Director—Stephen Taber. No report submitted.

UTAH

Director—Junius J. Hayes. No report submitted.

VERMONT

Director—Elbridge C. Jacobs. No report submitted.

VIRGINIA

Director—William M. McGill. No report submitted.

WYOMING

Director—S. H. Knight. No report submitted.

Club and Society Notes

Philadelphia Mineralogical Society

Vice-President H. W. Arndt presided at a stated meeting of the Society with 50 members and 35 visitors being present. The Secretary read a report detailing the statistics of the Rocks and Minerals Association National Outing for the Philadelphia area, held May 20th, at Cornwall, Penn.

The speaker of the evening, Prof. Frederick M. Oldach sketched briefly the history of the Cornwall Ore body and quoted Dr. Spence's report as listing over 100 mines and pits of the Cornwall type extending in a north-east, south-west direction from Easton, Penn., down into western Maryland. The deposit is a replacement similar to French Creek, but the host rock is different. In the discussion following, the presence and probable cause of lodestone was discussed.

Mineralogical Society of Southern California

The annual election and dinner for members of the Society was held in Arcadia on June 11th with 145 members attending. Officers elected for the new term were President, E. W. Chapman; Vice-President, Heber Clewett; Secretary, Wendell O. Stewart; Treasurer, Earl Calvert. Seven directors were also elected.

Announcement was made that the Society will enter an exhibition booth in the convention of the Federation of Natural Sciences which will be held at Pacific Palisades June 22nd to 28th. Geology Day will be celebrated June 25th at the convention. The Society will also hold an exhibit of crystals, polished specimens and lapidary outfits at the Machinery and Equipment Exposition and Mining Show which will be held at the Shrine Auditorium in Los Angeles July 30th to August 4th.

Long Island Mineralogy Club

The Long Island Mineralogy Club met at the home of the sponsor for its first meeting in June, the usual business was transacted and then the members present went by cars to Lawrence, L. I., and spent the balance of the evening at the home of Mr. Royal Heath. Mr. Heath has extensive collections of minerals, shells, corals, insects, rare and unusual plants, tropical fish an dother interesting material. It is needless to state that it took considerable time to view the many exhibits. At a rather late hour, the members departed and all voted the evening a complete success.

Persons interested in the club and its activities can obtain information by addressing the corresponding secretary, Miss Margaret Palmer, Box 214, Locust Valley, L. I., N. Y., or the sponsor, H. W. H. Stillwell, Rockville Centre, L. I., N. Y.

READERS' SECTION

Editor "R. & M.":

Since my suggestion of a mineral catalog appeared in ROCKS and MINERALS, I have received many letters from collectors who have expressed a desire to see such a work made a reality. There are few mineral collectors who have not felt the need of a catalog which would enable them to place a true value on a specimen which they had exchanged with another collector or which they had picked out of a mine dump.

After discussing with others the possibilities of the publication, I have decided to make an earnest effort to compile this much needed catalog. Many correspondents express the belief that it is impossible to ever gather together enough material to make this work a success. If every collector will co-operate in sending in the needed information, it should not be long before a first edition can be printed. The first printing will be far from perfect. After a period of use and criticism, a second and corrected edition will be issued. A yearly revision of the catalog will keep collectors posted as to new mineral discoveries, and variations in commercial mineral and specimen prices.

A catalog for mineral collectors should contain:

1. A list of all known and collectible minerals.

2. A price representing a retail value of every purchasable specimen.

3. A record of the finest or largest specimen of each mineral listed.

Collectors throughout the world can be of the greatest service in furnishing information for the third item. If you have seen what is reputed to be the largest Galena crystal known, send me a full description of it as to size and outstanding features. Do this for any very choice specimens you have seen. Please include the name of the present owner of each specimen, whether it is in a museum or private collection.

A collector in Chile writes that he owns what he considers to be the finest known specimen of crystallized kröhnkite. It consists of one crystal ¼" x ½" x 2½" which is quite clear and blue. In the middle of this, growing at an angle of 60 degrees from the two prisims, is another crystal ¼" x ½" x 3". Are these the largest crystals of kröhnkite you have ever seen? If not send me the description of any larger ones.

As soon as sufficient material is on hand, a printed list of my first findings will be mailed to collectors for their criticism and suggestions. In this way accurate information may be compiled for publication.

The success of this undertaking is dependent on the interest shown by those who will benefit by this catalog. If every collector will immediately send me the description of at least 10 choice specimens, work on the preliminary list will begin at once.

Address all communications to John M. Grieger, 405 Ninita Parkway, Pasadena, California.

Editor "R. & M."

Please find enclosed $1.00 for which send me a copy of "How to Collect Minerals." I like your little journal very much and will surely continue to take it as long as I live. I am a collector of everything I can find and live in a country that is rich in minerals.

Prescott, Ark. H. H. ALLEN.

Editor "R. & M."

I wish to place on record my appreciation of your pamphlet "The Working of Semi-Precious Stones" by J. H. Howard. Prior to my receipt of it my experience was exactly as described in the introduction. I wrote to three universities, ransacked two libraries, inquired of opticians, jewelers, etc., without obtaining any useful information. The Monograph has been my salvation, for which accept my best thanks.

C. B. SCREIBER.
Victoria, B. C., Canada.